

late, with the median area a little raised; the thorax convex behind the neck, transverse, arched at the sides, anterior angles obtuse, lateral margin narrow, very clearly punctured, punctures least close on the disk; the elytra punctate-striate, striae deep and well-marked; the legs, palpi, and antennae are concolorous with the paler parts of the body.

Hab. Main island. At Nikko an old tree, rotten as touch-wood and ivy-grown, yielded eight specimens. Single examples were taken fortuitously in other places by beating foliage.

LIX.—*Description of the Skull of Pisodus Oweni, an Albulalike Fish of the Eocene Period.* By A. SMITH WOODWARD, F.L.S.

[Plate XVII.]

It is now a well-established fact that many types of Teleostean fishes have undergone very little change since the Eocene, or even since the latter part of the Cretaceous period. Several well-defined genera seem to date back thus far, and others are represented by forms that differ in but small particulars. Moreover, a few of the most remarkable specializations in piscine skeletal anatomy characterizing the existing fauna are already recognizable in certain closely related Eocene types, and the progress of discovery is continually adding to the number of known examples. A most striking new case has lately been met with by the present writer among the fishes from the London Clay (Lower Eocene), and this forms the subject of the following notes.

So long ago as 1845 Sir Richard Owen described and figured the tritoral dentition of an unknown fish from the London Clay of the Isle of Sheppey under the name of *Pisodus Oweni* (ex Agassiz, MS.)*. The original specimen is preserved in the Museum of the Royal College of Surgeons, and exhibits an ovate pavement of small rounded or polygonal teeth firmly fixed in shallow sockets upon a plate of true bone. Appearances suggested to Sir Richard Owen that the fossil had been attached "to another bone of the skull, most probably, as in the *Glossodus* and *Sudis*, to a median bone of the hyoid system." Agassiz, who first examined the specimen,

* R. Owen, 'Odontography,' p. 138, pl. xlvii. fig. 3 (1845).

supposed it might pertain to a so-called Pycnodont Ganoid *; and in Owen's 'Palæontology' (edit. 2, 1861, p. 174) *Pisodus* is also doubtfully quoted as a "Ganoid" of uncertain position.

It now appears from a nearly complete skull in the British Museum that the problematical fossil in question is the parasphenoid dentition of a fish remarkably similar in cranial characters to the recent Clupeoid *Albula*. The fact has already been incidentally mentioned in a record of the discovery of *Pisodus* in the Middle Eocene of Belgium †; and it only remains to justify, by a detailed description and figures, the recognition of an *Albula*-like fish at so remote a period as that of the Lower Eocene. Dr. Shufeldt's admirable description of the skull of the recent *Albula vulpes* fortunately suffices for requisite comparison ‡.

The fossil skull in question is imperfectly preserved in several respects, though exhibiting most of the principal characters. It is shown of one half the natural size, from four aspects, in the accompanying Plate XVII. The rostral region is wanting, the projecting lateral portions are broken away, and the basioccipital and basisphenoid bones are in great part removed by fracture. The general form of the cranium, however, is recognizable, and the great expansion of the parasphenoid, with its tritoral dentition, is especially well displayed. The cranial roof (fig. 1) is flattened and terminates abruptly behind in a straight occipital border. The occipital face (fig. 2) is nearly vertical; and the basioccipital axis is approximately parallel with the cranial roof, meeting the dentigerous portion of the parasphenoid in a sharp angulation (fig. 4).

On the occipital face (fig. 2) the two exoccipital elements (*ex.occ.*) are observed immediately above the foramen magnum (*f. m.*), and seem to have been originally apposed in the median line except at their upper extremity. These bones are deeper than broad, so far as preserved, quadrilateral, and with a slightly concave outer surface. Their superior internal angles are truncated for the reception of the lower end of the large triangular supraoccipital (*s.occ.*), which is flattened, but shows remains of a T-shaped, backwardly directed, mesial crest (*c*) in its upper two thirds.

* L. Agassiz, Poiss. Foss. vol. ii. pt. ii. p. 247 (1844).

† Smith Woodward, "Notes on some Fish-remains from the Lower Tertiary and Upper Cretaceous of Belgium," Geol. Mag. [3] vol. viii. p. 108 (1891).

‡ R. W. Shufeldt, "The Osteology of *Amia calva* &c.," Ann. Rep. U.S. Fish Commission, 1883, pp. 61-67, pls. xii., xiii.

The supraoccipital bone also appears as a narrow band at the hinder margin of the cranial roof (fig. 1, *s.occ.*) bordering the pair of very short and broad parietal elements (*pa.*). These bones are not symmetrical, the mesial suture being bent and distorted to the right. They are much smaller than the squamosals (*sq.*), of which that of the left side is preserved to a large extent. The frontal bones (*fr.*) are relatively enormous, and all the smaller roof-bones by which they would be bounded laterally and anteriorly are unfortunately removed. While for the most part flat, this pair of bones is mesially depressed in the hinder two thirds of its extent, and thus originates a great hollow gradually deepening forwards to a sudden termination.

Of the bones in the otic region only portions of the pro-otic and opisthotic remain, and these are not sufficiently well preserved for description.

The three teeth displayed in their sockets in the parasphenoid bone (fig. 3, *pas.*) have been much worn during the life of the fish, all the gano-dentine being removed from the top of the flattened crown.

Nothing further need be added to indicate how closely the cranium thus described resembles that of *Albula* treated by Dr. Shufeldt in the memoir already referred to. So far as preserved the fossil agrees with the recent skull even to minute particulars, and, apart from size, there is little to indicate specific, much less generic, differences. The rostral region may, however, have presented a different configuration from that of the existing *Albula*; and in the absence of all knowledge of the trunk it is impossible to arrive at any definite generic determination. The Eocene fish from Sheppey must therefore retain its provisional name of *Pisodus Oweni*, and the description of the skull now published merely establishes its family position.

EXPLANATION OF PLATE XVII.

Pisodus Oweni, Owen (ex Agassiz, MS.). Skull shown from four aspects, one half the natural size.—London Clay, Isle of Sheppey. [Brit. Mus. no. 39439.]

Fig. 1. Cranial roof. *c*, base of crest on supraoccipital; *fr.*, frontal; *pa.*, parietal; *s.occ.*, supraoccipital; *sq.*, squamosal.

Fig. 2. Outline of occipital face. *ex.occ.*, exoccipital; *f.m.*, foramen magnum.

Fig. 3. Base. *pas.*, parasphenoid, showing three teeth and sockets of others.

Fig. 4. Side view. *orb.*, position of eye.